

# **DRAFT FOR COMMENT — NOT FOR GENERAL DISTRIBUTION** (Yo, reader – this thing isn't done yet...)

## **Report to the Navajo AUM Collaboration: Environmental Assessment Options in the Church Rock Mining District**

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### **Introduction**

#### **Review of Outdoor Radon Levels in Northwestern, New Mexico, 1978-1998**

Outdoor radon and radon progeny levels were measured in uranium mining areas and areas not affected by uranium development in McKinley and Cibola counties in northwestern New Mexico between 1978 and 1998. Airborne radon monitoring was conducted by mining companies in support of license applications and by the New Mexico Environmental Improvement Division (NMEID; now the New Mexico Environment Department) at more than 60 sites in essentially four different areas:

- ☐ Ambrosia Lake/Milan/Bluewater — an active mining region located 5 to 20 miles northwest of Grants, N.M.
- ☐ Church Rock — an active mining area located 12 miles northeast of Gallup
- ☐ Crownpoint/Lake Valley — a non-mining area located 40 miles northeast of Gallup
- ☐ San Mateo, N.M. — a mining area (before mining) located 20 miles north of Grants

Average annual outdoor radon levels reported in field studies conducted in these four areas are summarized in **Table 1**. The Crownpoint/Lake Valley and San Mateo areas were considered background locations because they had not been affected by commercial-scale uranium mining and milling when the studies were conducted in the late-1970s and early-1980s. NMEID's two-year study (Buhl, et al., 1985) of radon levels in the active mining areas of Ambrosia Lake, Milan and Bluewater in 1979 and 1980 included monitoring stations that the agency determined to be reflective of both background conditions and conditions influenced from radon releases from mines, mills and tailings disposal facilities in the region. At the time, the area was host to the three largest uranium mills and tailings piles in the U.S. Radon monitoring was conducted in the Church Rock mining district during active mining between 1977 and 1981 and after mining had ceased in 1987-88 and 1998.

Typical outdoor background levels of radon<sup>1</sup> in the continental US range from 0.1 to 0.2 picoCuries per liter-air (pCi/l)<sup>2</sup>, but may vary considerably on a daily and seasonal basis.

<sup>1</sup> In nature, radon is composed of radon-222 (half-life 3.8 days) and radon-220 (with a half-life of 56 seconds). The major contributor to human dose is radon-222. Environmental measurements do not distinguish between the two isotopes.

Average radon levels measured at nearly all "background" monitoring stations in northwestern New Mexico were within or slightly higher than this national range. Average Rn at Crownpoint monitoring sites ranged from 0.10 to 0.28 pCi/l-air within ranges of 0.01 to 0.87 pCi/l. Similar background levels were observed at Lake Valley and San Mateo stations prior to mining operations. NMEID determined that average background levels in the Ambrosia Lake area — between 0.42 and 0.57 — may have been influenced by mining-related releases due to wind "channeling" effects.

Average radon levels at stations near active mining and milling areas of Ambrosia Lake/Milan/Bluewater and Church Rock were more than an order of magnitude greater than background levels. Average non-background Rn levels in Ambrosia Lake were 3.20 pCi/L in 1979 and 4.66 in 1980. Similarly, average radon levels at 7 sites around the United Nuclear Corp. uranium mill and tailings disposal area in Church Rock in 1980-81 ranged from 2.54 to 4.05 pCi/L. Air monitoring conducted by Hydro Resources, Inc., at its proposed Section 8 (T16N, R16W) in-situ leach mine in Church Rock in 1987-88 found average annual Rn values of 1.18 to 3.06 pCi/L. HRI's monitoring sites were located next to the abandoned Old Church Rock Mine operated by UNC in the late-1970s in adjoining Section 17. Maximum average Rn concentrations during 1980-81 and 1987-88 exceeded 13 pCi/l at these sites. Active mining and milling in the area ended in 1983 and discharges of mine dewatering effluent to the Pipeline Arroyo and North Fork of the Puerco River ended in 1986.

In 1998, UNC reported radon levels of slightly greater than 1.0 pCi/L at two stations next to the tailings disposal cell. These measurements were taken after the 3-to-6-foot radon "cover" had been placed on the tailings in the mid-90s.

One Church Rock monitoring site described by UNC as "background" was located at the Springstead Trailer Park in Section 30, T16N, R16W, approximately six miles south of the UNC mill. In 1980-81, radon levels at this site averaged 3.43 pCi/l with seasonal averages exceeding 12 pCi/l.

The most common sampling device used in these studies was the Track Etch monitor, in which plastic films record alpha particle (i.e., alpha radiation) tracks, thus allowing for measurement of long-term average concentrations. NMEID used an integrating air sampler described by Sill, et al. (1969). Charcoal canisters used for short-term measurements were used at sites in the Crownpoint area in 1981-82.

The radon data reported for the Crownpoint and Church Rock sites indicate that while Crownpoint radon levels appeared to be more or less at natural background levels, the radon levels at Church Rock in the 1980s — both during and after mining — were dominated by non-background sources. Sources of radon in the Church Rock area during this period included:

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<sup>2</sup> National Commission on Radiological Protection (NCRP). Exposure of the Population in the United States and Canada from Natural Background Radiation. NCRP Report No. 94. Bethesda, MD 1987

- ❑ 13 sites where uranium was explored for, mined or processed between the early-1950s and the mid-1980s;
- ❑ bottom sediments of the Puerco River, which was dominated by mine-water releases between 1969 and 1986 and affected by the July 1979 tailings spill at the UNC mill; and
- ❑ natural ore deposits in rocks exposed at the surface.

No studies have been conducted in the Church Rock area to determine the relative contributions of natural conditions and anthropogenic sources to the overall radon burden. No ambient monitoring has been conducted since 1988 (with the exception of two quarters of radon measurements at the UNC tailings disposal area in 1998) to determine current outdoor radon levels. And, to our knowledge, no indoor monitoring has been conducted in homes in the area.

The radon levels measured in the 1970s and 1980s in the Church Rock area greatly exceed the Nuclear Regulatory Commission's (NRC) limit of 0.2 pCi/l on radon released from licensed activities, such as from uranium mills and tailings. This limit is roughly equivalent to NRC's exposure limit of 100 millirem per year to members of the public. The average radon levels recorded outdoors in the '70s and '80s approached, and in some cases exceeded, EPA's "action level" for indoor radon of 4.0 pCi/l. In other words, if these outdoor levels had been detected inside homes, mitigation measures to vent indoor air would have been made to local homeowners.

#### **Status of Litigation over Reclamation at the UNC Northeast Church Rock Mine (T16N, R16W, Sec. 3 and T17N, R16W, Sec. 35)**

#### **Observations from the October 2002 Church Rock District Tour**

#### **Recommendations for Environmental Exposure Assessments**

Based on our knowledge of historical radon levels in the Church Rock area and on our observations of the close proximity of local residents to uranium-related contaminant sources, we recommend the following strategy for addressing environmental health concerns in Church Rock and adjoining chapters:

1. **Prioritize environmental assessments at three specific locations:** the "Hood Family" area between the old Kerr-McGee Church Rock Mine and the abandoned UNC Northeast Church Rock Mine (roughly T17N, R16W, Sec. 35 and north onto the Navajo Reservation); the "King Family" area immediately east of the Old Church Rock Mine (T16N, R16W, Secs. 8, 9, 16 and 17); and the "Springstead Estates" site (T16N, R16W, Sec. 30).
2. **Conduct gamma radiation surveys in each of the priority areas:**
3. **Collect soil and water samples from the Hood Family Area for radiological, trace metal and chemical analyses: ...**
4. **Select sites for and install E-Perm radon monitoring devices at each priority area: ...**

**5. Install 7-day radon canisters in homes in the Hood Family and King Family areas: ...**

**6. Initiate government-to-government contacts to facilitate long-term responses:**

- (a) NNEPA should contact the New Mexico Mining and Minerals Division to indicate its interest in the participating in development of the reclamation plan for the UNC Northeast Church Rock Mine
- (b) NNEPA should contact the Navajo Housing Authority and Ft. Defiance Housing Corp. to invite NHA and FDHC to participate in environmental assessments (radon monitoring, gamma surveys, and soil sampling) at the Springstead Estates site
- (c) The NAUMC should request assistance from EPA's Las Vegas radiation lab in providing E-Perm radon samplers and processing soil and water samples for radionuclides
- (d) The NAUNC should request the assistance of NTUA's laboratory of analyzing water samples from the Hood Family area.

Regarding the UNC Northeast Church Rock Mine, the goal of this strategy is turn over environmental assessments of the site to an independent third party that the Navajo Nation, the community and other institutions trust. The TAMs Center may be a qualified and "acceptable" institution to coordinate the project.

A community outreach program should be developed to obtain advice and consent, and ongoing participation, of elected officials and residents from Church Rock, Pinedale, Standing Rock and Nahodishgish chapters in this project.

**Table 1. Average concentrations of radon in outdoor air at locations in northwestern New Mexico, 1978-1998**

Location(s) (T-R-Sec)	Sampling period	Rn Monitor Devices Used	No. Rn Monitor Stations	Average Annual Radon Levels (pCi/l) (all stations) [range: min. to max.]	Data Source(s)
Ambrosia Lake/ Milan/Bluewater Mining District					
Background stations	04/78 - 02/79	Integrating Air	9	0.42 – 0.57 [0.36-1.12]	Buhl et al., 1985
	04/79 - 03/80	Sampler	10	0.50 – 0.53 [0.14-0.81]	
Non-background stations	04/78 - 02/79	Integrating Air	6	3.20 [2.01-4.23]	Buhl et al., 1985
	04/79 - 03/80	Sampler	6	4.66 [3.23-6.40]	
Church Rock Mining District					
UNC Mill/Tailings Site (16.16.2)	4/77 – 10/79 (12 days)	Lucas Chamber	3	0.93 – 1.76 [0.06 – 8.76]	UNC, 1981
UNC Facilities: (Mill site: 16.16.2) (Old CR Mine: 16.16.17) (Springstead: 16.16.30)	10/80 - 7/81	Track Etch	6	2.54 – 4.05 [1.19-13.54]	UNC, 1981
			1	3.60 [1.25-10.77]	
			1	3.43 [1.19-12.19]	
HRI ISL Site: (16.16.8)	08/87 - 09/88	Track Etch	3	1.18 to 3.06 [0.1 – 13.4]	HRI, 1993
UNC Tailings Site (16.16.2)	1998	(unknown)	2	1.03 [0.4 – 1.5]	UNC, 1998
Crownpoint Area (non-mining)					
Mobil ISL Pilot Project (17.13.9)	04/78 - 05/78	(unknown)	West	0.24 – 0.53	HRI, 1992
			South	0.20 – 0.60	
			East	0.21 – 0.31	
Crownpoint, Town (17.14.??)	04/78 - 02/79	Integrating Air	2	0.10 - 0.13	Buhl et al, 1985
	04/79 - 03/80	Sampler	2	0.15 - 0.17	
HRI ISL Site (17.13.24)	02/81 - 10/82	Charcoal canisters	2	0.22 to 0.28 [0.1 – 0.87]	HRI, 1989
Lake Valley (Phillips Nose Rock Mine)	1978?	(unknown)	11 samples	0.25 $\checkmark$ 0.05 $\checkmark$ -	Buhl, et al., 1985 (Table 4.1)
San Mateo, N.M. (non-mining)					
San Mateo (town)	1979?	(unknown)	19 samples	0.14 $\checkmark$ 0.05	Buhl, et al., 1985 (Table 4.1)
Gulf Mill Site (before use)			20 samples	0.21 $\checkmark$ 0.02	

**References:**

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